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DOMESTIC DOGS IN COMMUNAL LANDS : IMPLICATIONS FOR CAMPFIRE SCHEMES

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1. Introduction

The relationship between man and dog began approximately 14,000 years before present (BP) with the onset of the Mesolithic period, when human societies evolved from nomadic hunter-gathering towards sedentary agro-pastoralism. Whereas primitive dogs were probably kept by hunter-gatherers for food rather than for any other economic function, Mesolithic agro-pastoralists began to use dogs as herders of livestock, guards of settlements and crops against wildlife, and as trackers and coursers of game when people hunted (Clutton-Brock 1993; 1995). Agro-pastoralism reached southern Africa with the Bantu immigration approximately 1,500 BP, and this agricultural system broadly persists in Zimbabwe's communal lands today (Garlake 1978; Beach 1980; Mudenge 1988). Thus dogs probably still serve similar economic purposes in present day communal lands as they did in early Bantu society.

Many of these agro-pastoralist communal lands border wildlife reserves, and bear considerable costs from wildlife damage such as crop-raiding elephants, buffalo, baboons and monkeys, and livestock-killing leopards, lions, spotted hyaenas and jackals (e.g. Hawkes 1991; Hawkes 1994; Madzudzo 1994). In order to compensate for these costs and to encourage local economic development, the CAMPFIRE (Communal Areas Management Programme for Indigenous Resources) model has been established in several communal lands, whereby the revenue gained from sustainable wildlife utilisation schemes is channelled to the incumbent community; in turn, an incentive is created to conserve local wildlife stocks for future exploitation (Peterson 1991). In practice, the feasibility of such projects may be complicated. One possible problem is the traditional hunting of game with dogs in CAMPFIRE areas, either for meat or for pest control, which would undermine the ethos of any such scheme. Another is the possible impact of dogs on the local wildlife resource as predators in their own right. Set against these costs are the benefits that households may gain from having dogs, such as their other traditional role as guards against wildlife problem animals.

The aim of this paper is to assess the costs and benefits of the traditional uses of dogs by communal land farmers in CAMPFIRE areas. The paper draws on a study of the ecology of communal land dogs in Zimbabwe, which was initiated in 1994 to consider their role in rabies epidemiology and possible impacts on wildlife conservation (see Butler *in prep.*).

2. Methods

2.1 National questionnaire survey

To collect baseline data on the communal land dog population, a household questionnaire (see Appendix) was designed following the guidelines of the World Health Organisation (WHO/WSPA 1990). Among other lines of inquiry, dog-owning households were asked open-ended questions about dog husbandry, reasons for keeping dogs, and their hunting practices. Hunters were asked about the reasons for hunting, species hunted, numbers of dogs used, and frequency of hunting trips. Dog-owning households which did not hunt were asked about their reasons for not doing so.

Sampling of households was undertaken by following roads passable by vehicle within each communal land surveyed. Every alternate house within a perpendicular distance of 500 m from the road was sampled. Wherever possible only adults were interviewed. If the occupants of a household were absent or only children were present the adjacent household was interviewed instead. Local Veterinary Extension Assistants from the Department of Veterinary Services conducted the interviews and I recorded the responses. Questions about hunting were asked from a veterinary perspective in an attempt to minimise respondents' fears of recrimination, and therefore the accuracy of replies. Although not strictly random in design this sampling method was random in effect as there was no prior knowledge or planning of the routes that were ultimately driven. In communal lands with CAMPFIRE schemes, however, routes were concentrated in the CAMPFIRE areas.

2.2 Communal lands surveyed

Five agro-ecological regions have been defined in Zimbabwe by Vincent & Thomas (1960), within which agro-pastoralist systems and human population densities vary. These range from Region I (high rainfall, specialised and diversified farming) to Region V (low rainfall, extensive livestock production). The following seven communal lands (Figure 1) were selected to represent the five agro-ecological regions: Ngorima (Region I), Soswe (Region II), Kandeya (Region II/III), Gokwe (Region III/IV), Tsholotsho and Dande (Region IV) and Mtetengwe (Region V). Variations in dog husbandry may also occur between ethnic groups; consequently the sample of communal lands was also used to represent the ethnic areas of Shona (Ngorima, Soswe, Kandeya and Gokwe), Ndebele (Gokwe, Tsholotsho) and Venda (Mtetengwe). The communal lands were sampled between March and October 1994.

In north-western Tsholotsho (bordering Hwange National Park), north and western Dande (bordering Chewore and Dande Safari Areas) and western Gokwe (bordering Chirisa Safari Area and the Sengwa Wildlife Research Area), CAMPFIRE-type schemes have been established.

2.3 Gokwe communal land detailed study site

To study further aspects of dog ecology, a 33 km^2 section of Gokwe communal land (GCL) bordering the Sengwa Wildlife Research Area (SWRA; 18° 10'S, 28° 15'E) was established as a detailed study site (Figure 2). The study area abuts 16 km of the SWRA boundary, and the local community suffers severe wildlife problems. The area is part of a local CAMPFIRE initiative.

Between January 1995 and June 1996 data were collected on the feeding ecology of dogs and their home range and social ecology. Local inhabitants were invited to report all animals killed while hunting with dogs, and the number of dogs used. While observing 16 radio-collared study animals, their independent predatory behaviour was noted, and local people were also asked to report any independent kills made by dogs that they had witnessed, and the number of dogs involved.

To assess the role of dogs as scavengers competing with wild carnivores along the boundary of the SWRA, a total of 12 goat and impala carcasses were staked out at six sites, two at each site (Figure 2). Two sites were located 1 km within the SWRA from

the boundary fence, two on the boundary fence, and two 1 km within the GCL study site. One carcass was studied per month, and each was staked out at the full moon to enable nocturnal observation. A hide was built 30 - 50 m from each carcass, and the carcass was observed around the clock until fully consumed by scavengers. By weighing the carcass when first staked out it was possible to estimate the amount (kg) of each carcass consumed by each scavenging species. The results for sites within the SWRA, on the boundary fence and within GCL were pooled and compared.

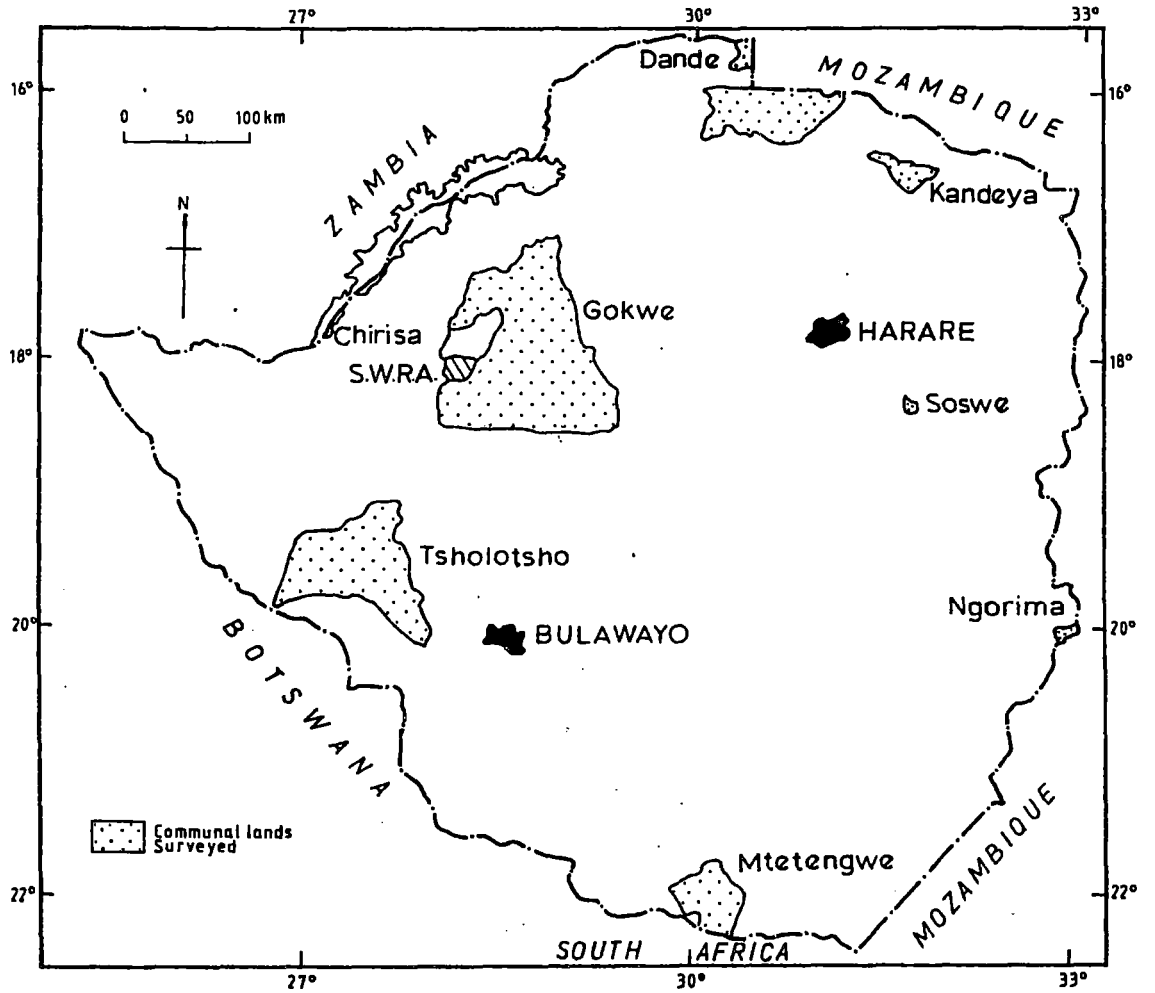

Figure 1. The seven communal lands surveyed between March and October 1994. The locations of the Sengwa Wildlife Research Area (SWRA) and Chirisa Safari Area are also marked.

3. Results

A total of 705 households were surveyed, owning a total of 1,085 dogs. Overall, the majority (62%) of households owned dogs (Table 1). There were significant differences among the numbers of dog-owning households in the seven communal lands surveyed (χ^2=35.4, d.f.=6, $p<0.001$), but dog husbandry was uniform amongst all agro-ecological and ethnic areas: all dogs were fed and were unrestricted by tying-up or by enclosures surrounding homesteads. The primary use of dogs was as 'guards against human intruders', although their use as guards against wildlife problem animals was

most important in Tsholotsho and Mtetengwe, and also of considerable importance in Ngorima (Table 1). In Mtetengwe, where predation by black-backed jackals on goats was widespread, some dog-owners trained their dogs to live with goat herds permanently to provide protection against this threat.

Of the CAMPFIRE communal lands Tsholotsho was the only location where dogs appeared to be of primary importance in combating a wide range of wildlife problems (Table 1). More households owned dogs in the CAMPFIRE communal lands than in the others (65% versus 60%), although the difference was not significant.

Hunting was rarely expressed as a primary use of dogs (Table 1). Table 2 indicates that among dog-owning households, even if not a primary use of dogs, hunting was uncommon, with only 14% admitting to the practice. The proportion of dog-owning households hunting in the CAMPFIRE communal lands (16%) was greater than in the 'other' communal lands (11%), but the difference was not significant. The vast majority of hunting households hunted with dogs for meat rather than for sport or pest control. The mean (± s.e.) number of dogs used among the total of 59 hunting households interviewed was 4.4 (± 0.7, range 1–10). The frequency of hunting varied greatly, from daily to once a year, and the median value was once a month.

The reasons why dog-owning households did not hunt are given in Table 3. The most common explanation was that there was 'no man to do it' in the household, because he was either away working 'in town' or boys were away at school. Equal numbers of houses gave 'no interest/lack of time' and 'nothing to hunt' as reasons. Among the CAMPFIRE communal lands there was notable awareness of the illegality of hunting, and significantly more households gave this reason for not hunting (24%) than in 'other' communal lands (5%: χ^2=22.7, d.f.=1, p<0.001).

An analysis of the wildlife prey hunted by men with dogs (Table 4) indicated that the most common animal killed was the scrub hare. Notable was the predominance of small game killed by hunters. In the questionnaire survey, 81% of prey killed had a maximum body mass of <10 kg, and 19% were >10 kg, a significant difference (χ^2=21.2, d.f.=1, p<0.001). Similarly, in the Gokwe communal land site, 77% weighed<10 kg and 13% weighed >10 kg, also a significant difference (χ^2=10.4, d.f.=1, p<0.005). While small prey were generally killed outright by the dogs, larger animals such as kudu, warthog, bushpig, bushbuck and waterbuck were baled by the dogs and killed by the hunters themselves. While it was hard to determine where hunting took place from the respondents in the questionnaire survey, those hunters in the GCL site used dogs chiefly in the communal land itself, while snaring was most common within the SWRA.

During 486 hours spent observing the study animals in the GCL study area, dogs were recorded chasing duiker, kudu and scrub hares independently of people, but never killed anything. Their diet constituted scavenged human waste, including carcasses, leftover food and human faeces, which together contributed 91% of their observed diet. However, 20 kills made independently by dogs were reported (Table 5). Once again, many of these species were small, although two impala and one kudu were killed. Most significantly, goats were the most common prey, and nine of the 20 (41%) were domestic animals. The mean number of dogs involved in these kills was 1.7 (± 0.2, range 1-4).

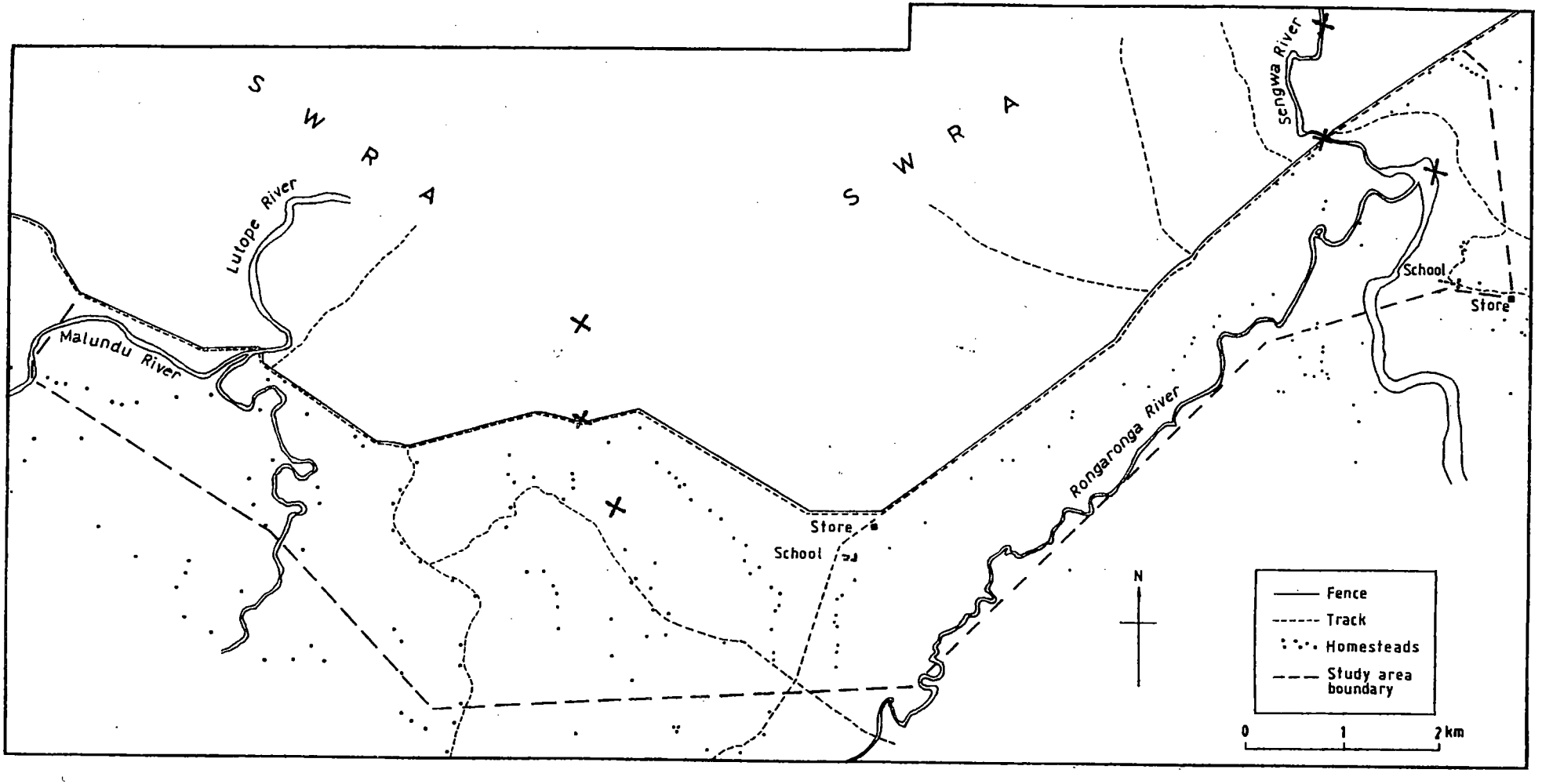

Figure 2. The detailed study area on the boundary of Gokwe communal land and the Sengwa Wildlife Research Area (SWRA). Sites used for carcass experiments are marked x.

Table 1. Households surveyed in the seven communal lands (CLs), the proportion owning dogs, and the primary reason for keeping dogs among dog-owning households. Forthwith G=Gokwe, T=Tsholotsho, D=Dande, N=Ngorima, S=Soswe, K=Kandeya, M=Mtetengwe

	CAMPFIRE CLs			OTHER CLs				
	G	T	D	N	S	K	M	**Overall**
Households surveyed	115	115	100	99	110	71	100	**705**
Households owning dogs (%)	62	72	59	46	65	47	78	**62**
'Guarding against human intruders' (%)	71	25	83	56	88	91	9	**60**
'Guarding against wildlife problems' (%)	28[a]	70[b]	14[c]	42[d]	12[d]	0	91[e]	**42**
'For hunting' (%)	1	1	0	0	0	1	1	**1**

[a] Crop-raiding baboons, elephants, buffalo and springhare; livestock-killing lions, leopards, baboons and small carnivores

[b] Crop-raiding elephants, springhares and black-backed jackals, livestock-killing spotted hyaenas, black-backed jackals, lions and leopards

[c] Crop-raiding elephants, baboons and monkeys; livestock-killing leopards, lions, spotted hyaenas and small carnivores

[d] Crop-raiding baboons and monkeys

[e] Crop-raiding baboons and monkeys; livestock killing black-backed jackals

Table 2. The proportions of dog-owning households hunting with dogs among the seven communal lands (CLs) surveyed, and the types of hunting undertaken, expressed as a percentage of hunting households

	CAMPFIRE CLs			OTHER CLs				
	G	T	D	N	S	K	M	**Overall**
Dog-owning households	68	83	59	45	71	33	78	**437**
Households hunting (%)	32	7	8	9	21	12	4	**14**
Hunting for meat (%)	77	67	100	75	93	50	100	**80**
Hunting for 'sport' (%)	14	33	0	0	7	50	0	**14**
Hunting for pest control (%)	9	0	20	25	0	0	0	**6**

Table 3. The proportions of dog-owning households not hunting in the seven communal lands surveyed, and the reasons given, expressed as a percentage of the non-hunting households

	CAMPFIRE CLs			OTHER CLs				
	G	T	D	N	S	K	M	**Overall**
Dog-owning households	68	83	59	45	71	33	78	**437**
Households not hunting (%)	68	93	92	91	79	88	96	**86**
'No man to do it' (%)	22	31	22	32	52	41	44	**35**
'No interest/time' (%)	11	31	30	20	20	14	4	**19**
'Nothing to hunt' (%)	26	7	0	39	11	28	29	**18**
'Illegal/CAMPFIRE' (%)	15	18	39	0	5	0	8	**14**

Table 4. The frequency of wildlife species killed by men hunting with dogs, as reported by 49 hunters interviewed in the questionnaire survey and hunters reporting 52 kills in the Gokwe communal land (GCL) study site. Body masses of prey are taken from Estes (1991) unless indicated otherwise.

		QUESTIONNAIRE		GCL	
Prey species	**Maximum body mass (kg)**	**n**	**%**	**n**	**%**
Scrub hare	1.50	42	53	14	27
Mice	<0.20[a]	8	10	0	
Bush squirrel	0.20	6	8	5	10
Striped polecat	0.97	0		7	14
Rock dassie	4.00	0		7	14
Kudu	230.00	4	5	3	6
Baboon	50.00	4	5	5	10
Vervet monkey	9.00	3	4	0	
White-tailed mongoose	5.00	1	1	3	6
Bushbuck	40.00	3	4	0	
Giant rat	4.50	3	4	0	
Duiker	20.00	1	1	2	4
Genet	2.00	0		2	4
Warthog	82.00	0		1	2
Bushpig	62.00	1	1	0	
Impala	60.00	1	1	0	
Waterbuck	250.00	1	1	0	
Wild cat	2.50	0		1	2
Porcupine	15.00	0		1	2
Springhare	3.00	0		1	2
Francolin	0.70 [a]	1	1	0	

[a] field estimate

The carcass experiments in the GCL study area indicated that dogs dominate as scavengers in the communal land and on the boundary fence, but did not scavenge at any of the carcasses located 1 km within the SWRA. (Figure 3). However, radio-collared study animals were found scavenging on carcasses at this distance within the SWRA on three occasions. The dominant scavengers within the SWRA were vultures, which also occurred at the other sites but were out-competed by dogs.

Table 5. The 20 reported kills (n) made independently by dogs within the GCL study area between January 1995 and June 1996. The maximum body mass of prey species are taken from Estes (1991) unless otherwise indicated

Prey species	n	%	Maximum body mass (kg)
Goat	6	30	30.00[a]
Impala	2	10	60.00
Striped polecat	2	10	0.97
Sheep	1	5	30.00[a]
Kudu	1	5	230.00
Domestic cat	1	5	2.00[a]
Baboon	1	5	50.00
Vervet monkey	1	5	9.00
Scrub hare	1	5	1.50
Springhare	1	5	3.00
Hedgehog	1	5	0.40
Gerbil	1	5	0.10
Domestic chicken	1	5	1.30[a]

[a] field estimate

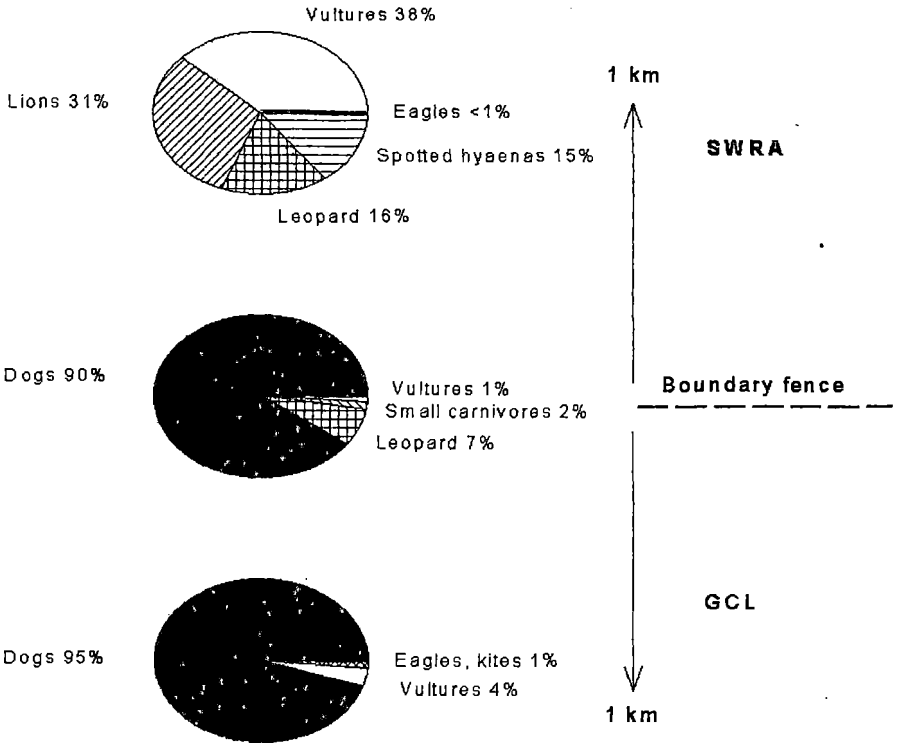

Figure 3. The results of the carcass experiments carried out at sites 1 km inside the Gokwe communal land (GCL) study area, on the boundary game fence with the Sengwa Wildlife Research Area (SWRA) and 1 km inside the SWRA, between January 1995 and June 1996.

The pie charts express the proportions of total carrion consumed by scavengers at each site, as estimated from known weights of carcasses and observed amounts of each consumed by the different scavengers

4. Discussion

Clearly dogs have maintained their traditional economic importance in modern agro-pastoralist society in Zimbabwe. Their most common use is to guard property against human intruders, and a similar result was found by Brooks (1990) when surveying the national dog population. However, in Mtetengwe, Tsholotsho, Gokwe and Ngorima dogs were of considerable importance as guards of crops and livestock against marauding wildlife (Table 1), a result which Hawkes (1994) also noted for Tsholotsho. That dogs were not more commonly used for this purpose among the CAMPFIRE communal lands may simply be a reflection of the variable levels of wildlife problems between communal lands. For example, Tsholotsho appears to suffer a wide range of problem animals (Hawkes 1994; Madzudzo 1994), while Dande does not (Table 1).

However, it may be notable that more households owned dogs among CAMPFIRE areas than among the 'other' communal lands surveyed (65% versus 60%), although the difference was not statistically significant.

Hunting was rarely considered a primary use of dogs (Table 1), although it is possible that hunting was under-reported for fear of recrimination. Even if under-reported as a primary use of dogs, it was clear from further questioning that few dog-owning households (14%) ever hunted. The most common reason for not hunting was that it is always men who hunt, and most are absent from rural households, either working away in town or being away at school (Table 3). It also seems likely that in any case, hunting with dogs has always been an uncommon activity among agro-pastoralists. In a pan-African study of hunting, Chardonnet *et al.* (1992) showed that wild animal protein is only a dry season compliment to the predominately vegetarian diet of agro-pastoralists, whilst hunter-gatherers rely on game meat to a greater degree. Furthermore, these authors concluded that among agro-pastoralists, hunted wildlife protein was more important in the diet of forest than savanna-dwelling communities, perhaps due to the relatively poor productivity of livestock in forest areas. Thus it is not surprising that the hunting of wildlife with dogs in the savanna communal lands of Zimbabwe is a rare activity.

Nonetheless, it is clear that what little hunting is done, its main purpose is to supply meat to the household (Table 2). Hunting with dogs to control wildlife pests was unimportant (Table 2), although in the Gokwe communal land study site, efforts were made to specifically hunt crop-raiding baboons, monkeys and springhares. Success was limited, and this form of hunting was regarded as a deterrent rather than any attempt to control the numbers of problem animals.

It is encouraging that amongst CAMPFIRE communal lands there was a wider awareness of the illegality of hunting than in 'other' communal lands, and that this reason was regularly given for not hunting (24% versus 5%). Again, it is possible that these figures were a result of respondents aiming to please, and the fact remains that more households hunted in CAMPFIRE areas than in 'other' communal lands (16% versus 11%), although this difference was not statistically significant.

Thus it seems that hunting with dogs in communal lands has a limited impact on wildlife resources within communal lands. Not only is the activity uncommon, but the size of wildlife prey killed by men hunting with dogs tended to be limited. In both the questionnaire survey and the Gokwe communal land study site a wide variety of wildlife species were killed (Table 4), but the vast majority were of a small size (<10 kg maximum body mass). Larger ungulate prey such as waterbuck, warthog, bushbuck and kudu were occasionally killed, but in all cases these animals would be baled by the dogs and killed by the hunter, whereas small prey of <10 kg body mass such as scrub hares were easily killed by the dogs themselves. This parallels the hunting success of Kalahari hunter-gatherers when using dogs: smaller species such as duiker and steenbok are most successfully hunted because the dogs kill the prey outright, whereas the only large ungulates which are killed are those which are easily baled, such as gemsbok and warthog (Blurton-Jones & Konner 1976; Yellen & Lee 1976). Thus populations of larger ungulate species, which are more likely to be of economic importance to CAMPFIRE schemes, are unlikely to be adversely affected by men hunting with dogs.

The limitations of hunting with dogs are probably exacerbated by the generally small size of communal land dogs (14 - 15 kg; Butler *in prep.*) and the small numbers of dogs used in packs (mean 4.4). Among wild carnivores, larger group size tends to increase co-operative hunting success (Packer & Ruttan 1988), and it is possible that if hunters could gather larger groups of dogs together the size of prey which they could overcome could be enhanced, and the potential impact of hunting on large ungulates increased.

The independent impact of dogs as predators on wildlife would seem to be limited for the same reasons. In the Gokwe communal land study site no kills were personally witnessed. Dogs were largely scavengers of human waste, and although they occasionally chased game they were never successful. The 20 reported kills indicated that dogs do catch some prey, but the small sample size suggests that this is rare. The small number of dogs involved in kills (mean 1.7) indicates that dogs do not forage in large groups, and this, along with their small body size, most certainly restricts their impact as predators. It is notable that 41% of the recorded kills were of domestic animals, perhaps further indicating their ineptitude as predators of wildlife.

The carcass experiments carried out in the Gokwe communal land study site indicated that dogs dominate wild scavengers in the communal land, but their influence recedes within a 1 km distance of the game fence boundary. This would appear to be of greatest relevance to vultures, which may be out-competed by dogs within the communal land. However, since vultures are unlikely to be of economic significance to CAMPFIRE schemes, the impact of dogs as scavengers would appear to be of little importance.

To conclude, it seems that the benefits of dog-owning to communal land farmers in CAMPFIRE areas outweigh the costs in terms of the dogs' threats to the viability of such schemes. Dogs maintain their traditional economic importance as guards of homesteads, crops and livestock against wildlife problems in CAMPFIRE areas. However, the activity of hunting with dogs is rare in all communal lands because wildlife meat forms an unimportant component of the agro-pastoralist diet in savanna regions, and few men are available to hunt. What little hunting is carried out has a minimal impact on populations of economically important large ungulates. Due to the small size of communal land dogs and the few dogs used in hunting packs, wildlife species of <10 kg body mass (such as scrub hares) are most successfully hunted. The impact of dogs hunting independently of people in CAMPFIRE areas is limited for similar reasons, and also because they are chiefly scavengers of human waste rather than predators of wildlife.

5. Acknowledgements

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APPENDIX

COMMUNAL LAND QUESTIONNAIRE No.

The information given in this interview will not be used to incriminate the interviewee in any way. For this reason the subject's name will not be taken.

1. Survey.....
2. Date.....
3. Distance from nearest communal land boundary[1].....
4. Number of people in household.....
5. Does home enclosure restrict dogs? Yes/No
6. Waste policy; open dump/closed dump/burning
7. Toilet facilities; indoor/outdoor/no facilities
8. Dogs owned:

No	Age	Type[2]	Hght. (mm)	Cond.[3] (1-5)	Origin	Castrated/ spayed? If not, why?	When last vaccinated for rabies? If not, why?
M1							
M2							
M3							
M4							
M5							
M6							
F1							
F2							
F3							
F4							
F5							
F6							

9. If household has no dog, why not?.....(go to Question 14)
10. Litters per bitch in past 2 years;

Bitch 1

Litters	1	2	3	4
Born	.....			
Died	.....			

---

[1] Distance of household (km) from nearest C.L. boundary with either commercial farmland, State Forest or National Parks estate.

[2] Types: 'shenzi' (average C.L. dog form); 'mongrel' (cross with larger, unid. Euro breed). If dog is Euro breed or an obvious cross, note what breed. Also note colour: ginger (dark-pale), black & white, ginger & white, black & tan/sable, black, brindle, white.

[3] Dog's condition (body fat covering): 1 = very poor, 5 = very good.

APPENDIX cont.

10. cont.

Bitch 2

Litters	1	2	3	4
Born	.....			
Died	.....			

Bitch 3

Litters	1	2	3	4
Born	.....			
Died	.....			

Bitch 4

Litters	1	2	3	4
Born	.....			
Died	.....			

11. How often do you feed your dogs?.....

What time of day?.....

What do you feed them?.....

12. Why do you keep dogs?.....

13. Are dogs restricted by day (Yes/No) or night (Yes/No)?

14. Records of dogs from house that have died or disappeared in past 2 years;

	Dog				
	1	**2**	**3**	**4**	**5**
sex	.....				
age	.....				
disappeared/unknown	.....				
killed by humans	.....				
runover	.....				
killed by[4]	.....				
died of old age	.....				
died of disease[5]	.....				

[4] Fill in cause of death; e.g. leopard, baboon, snake, other dogs etc.
[5] Describe symptoms.

APPENDIX cont.

15. Would you like more or less dogs than you currently have?.....

    Why?.....

16. Do other dogs scavenge at your home? Yes/No

    Are they owned or stray?.....

    How many?.....

    How often?.....

    What time of day?.....

    What do they eat?.....

17. Do you hunt with dogs? Yes/No Why?.....

    How frequently.....

    How many dogs.....

    Whose dogs.....

    Where.....

    What do you catch.....

18. Do you see or hear jackals? Never/Sometimes/Common. Other predators?.....

19. Do you know what the African wild dog is? Yes/No

20. Have you ever seen them? Yes/No

    When?.....

    Where?.....

    How many?.....

    Did they kill any livestock?.....

    Are they a threat to you or your stock?.....

    Do you chase them with dogs?.....

    Do you kill them for muti?.....

21. Do you know what rabies is? No/Uncertain/Quite clear

22. Do you like the rabies vaccination? Yes/No Why?.....

23. Would you prefer vaccine given to your dog through its mouth, as a food? Yes/No

    Why?.....

24. What do you do when your dog is sick?.....

25. Would you mind if vets came and took blood samples from your dogs? Yes/No

26. Would you mind if the Veterinary Department carried out an oral vaccination trial in your area? Yes/No